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FOREST INSECT AND DISEASE CONDITIONS

In The NORTHERN REGION

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U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE
DIVISION OF STATE AND PRIVATE FORESTRY

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FOREST INSECT AND DISEASE CONDITIONS IN THE NORTHERN REGION 1965

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COVER PHOTO: Damage to Douglas-fir caused by dwarfmistletoe (*Arceuthobium douglasii*).

U.S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
Division of State and Private Forestry
Forest Pest Control Branch
Region 1
Missoula, Montana

FOREST INSECT CONDITIONS

CONDITIONS IN BRIEF

The mountain pine beetle was the most destructive bark beetle in the Northern Region during 1965. It continued to destroy millions of board feet of mature white pine, infested many ponderosa pine stands, and remained chronic in several lodgepole pine forests. Severe infestations of the Douglas-fir beetle decreased since 1964 on the Flathead and Kootenai National Forests, Montana, and Nezperce National Forest, Idaho. They increased on the Bitterroot, Gallatin, and Helena National Forests, Montana. Fir engraver beetle damage was heavy within 15,000 acres east of Big Fork, Montana. Infestations of pine engraver beetles were scarce in the Region. Minor damage to larch limbs by the larch engraver beetle was reported on the Kootenai National Forest, Montana. A major outbreak of the Douglas-fir tussock moth, which developed in 1964, caused various degrees of defoliation on 225,000 acres of grand and Douglas-fir trees in Latah and Benewah Counties, Idaho, during 1965. Two minor infestations were active in northwestern Montana. By October, all of these infestations had terminated. Spruce budworm damage was apparent on 2,283,640 acres in both States. The population trend is downward. Populations of larch casebearers, which started to develop in a small area near St. Maries, Idaho, in the early 1950's, continue to spread throughout the larch type of the Northern Region. Infestations of a larch bud moth have been increasing since 1963. About 140,000 acres contained defoliated larch in the northern tip of Idaho and northwestern Montana. Damage by the larch sawfly decreased in northern Idaho but increased in Montana. A larch looper has become more abundant since 1963 in the Northern Region. Several thousand acres were infested near Libby and the head of the Swan River. A major epidemic of a pine tussock moth was recorded for the first time in 42,000 acres of ponderosa pine around Ashland and Fort Howes, Montana. A spruce bud moth caused some defoliation of Engelmann spruce and subalpine fir trees within Yellowstone National Park, Wyoming. Minor damage by the cottonwood leaf beetle, Douglas-fir needle midge, and pine needle-sheath miner was detected in a few areas within Montana.

BARK BEETLES

MOUNTAIN PINE BEETLE, Dendroctonus ponderosae Hopk. Damage remained at about the same level as in previous years throughout the Northern Region. Chronic infestations continued to deplete old growth western white pine stands in Idaho. In Montana, attacked trees were observed in ponderosa and lodgepole pine stands that were infested in past years.

Debarking of infested lodgepole pine trees by woodpeckers which were feeding on broods of mountain pine beetles.

The greatest losses in mature white pine stands occur on the St. Joe, Clearwater, Coeur d'Alene, and Kaniksu National Forests in Idaho. Killed trees were scattered throughout about 42,000 acres on the St. Joe National Forest. These infested areas were mainly within tributaries along the St. Joe River, North Fork Clearwater River, Little North Fork Clearwater River, Stony Creek, and East Fork Potlatch Creek. About 105,000 acres of timber on the Clearwater National Forest contained numerous killed trees. Infestation centers could be found wherever mature white pine stands predominated. The number of killed trees increased along subdrainages of the North Fork of the Coeur d'Alene River. Losses in mature white pine stands on the Kaniksu National Forest decreased in 1965. Some killing was detected near the head of the Upper Priest River in the Caribou, Ball, Boulder, and White Pine Creek drainages. Infestations are not expected to decrease in 1966 within the white pine stands of northern Idaho.

Groups of up to 100 dead and infested ponderosa pine trees were seen in four areas on the Lewis and Clark National Forest, Montana, within the Judith River drainages and Big Snowy Mountains. These infestations should decrease in 1966. The number of killed ponderosa pine trees increased along the Kootenai and Fisher River drainages in Montana.

Lodgepole pine stands that have been continually attacked for many years in Montana contained fewer dead trees in 1965. These stands are located near the headwaters of the Yaak River, within Glacier National Park, and along the Gallatin River drainage.

DOUGLAS-FIR BEETLE, Dendroctonus pseudotsugae Hopk. Although severe infestations have decreased on the Flathead and Kootenai National Forests in Montana and on the Nezperce National Forest in Idaho, they have increased on the Bitterroot, Gallatin, and Helena National Forests, Montana. The main problem areas on the above National Forests are tabulated below:

National Forests	Locations of outbreaks	Damage
Flathead	Drainages around Swan Lake	Sixteen groups of 10 to 70 trees
	Slopes around Tally Lake	Five groups of 10 to 40 trees
	Drainages southeast of Blaine Lake	Four groups of 15 to 100 trees
Kootenai	Head of Wolf Creek	Six groups of 5 to 150 trees
	Pinkham Creek	Nine groups of 2 to 50 trees
	Kootenai River (Libby-Yaak River)	Seventeen groups of 5 to 25 trees
Nezperce	West Fork Rapid River	Five groups of 20 to 50 trees
	Drainages north of Slate Creek to Grangeville	Ten groups of 10 to 70 trees
	Meadow and Bear Creeks	Twelve groups of 20 to 150 trees
Bitterroot	Headwaters of East Fork River	Twenty groups of 10 to 200 trees
	Headwaters of West Fork River	Eleven groups of 10 to 80 trees
Gallatin	Porcupine Butte (T. 5 N., R. 13 E.)	Heavy within 800 acres
	Bridger Mountains	Many areas, some containing up to 1,000 trees
Helena	Northeast of Lincoln	Three heavily infested 300- to 1,800-acre areas
	Drainages near head of Canyon Creek	Several 200- to 500-acre areas contain numerous killed trees.

FIR ENGRAVER, Scolytus ventralis Lec. Damage by this beetle in grand and subalpine fir stands was less than in 1964 throughout the Northern Region. The only major activity was detected within 15,000 acres east of Big Fork, Montana.

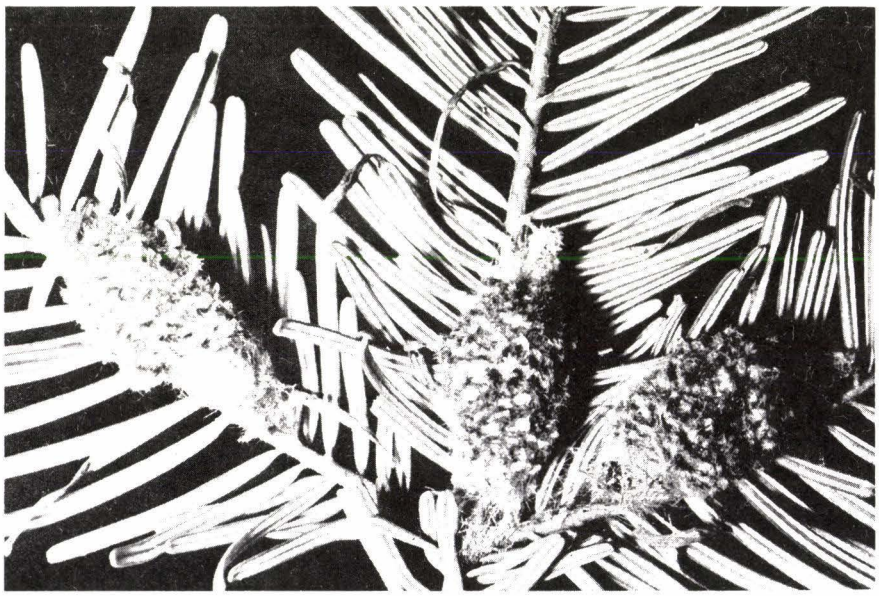
LARCH ENGRAVER BEETLE, Scolytus laricis Blkm. A small infestation was reported in the Lone Cabin Creek drainage on the Kootenai National Forest, Montana. The beetles attacked limbs on western larch trees.

PINE ENGRAVER, Ips pini Eichh. A few ponderosa pine stands contained some tree killing north of Keuterville, Idaho; along the west side of the Bitterroot Valley, Montana; and from Missoula into the Ninemile drainage in Montana.

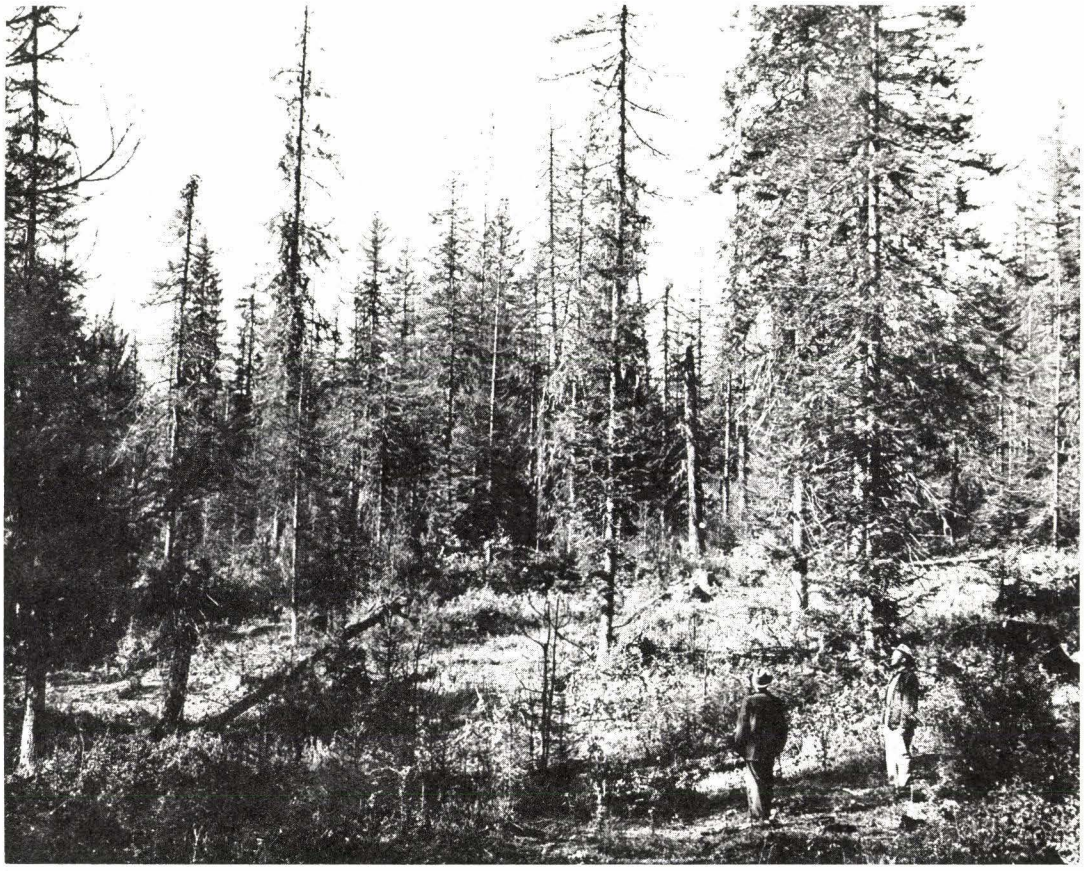
Groups of ponderosa pine trees killed by the pine engraver.

DEFOLIATORS

DOUGLAS-FIR TUSSOCK MOTH, Hemerocampa pseudotsugata McD. A major epidemic that developed in 1964 subsided within mixed stands of grand and Douglas-fir trees in Latah and Benewah Counties, Idaho. However, various degrees of defoliation occurred on 225,000 acres this season. Treatment of 120,000 acres with three-fourths pound of DDT in 1 gallon of fuel oil per acre and mortality from natural enemies, including a polyhedrosis virus, were responsible for terminating the epidemic. As a pilot test, about 1,000 acres were treated with 1 billion polyhedra per acre. This virus material was cultured in the laboratory. Preliminary results of this test did not look promising. Near Polson, Montana, about 250 acres were moderately defoliated in 1964 and 1965. Three 10- to 40-acre areas south of Elmo, Montana, were lightly defoliated in 1965. Examinations during October indicated that these infestations have also subsided.



Egg masses of the Douglas-fir tussock moth on a grand fir twig.

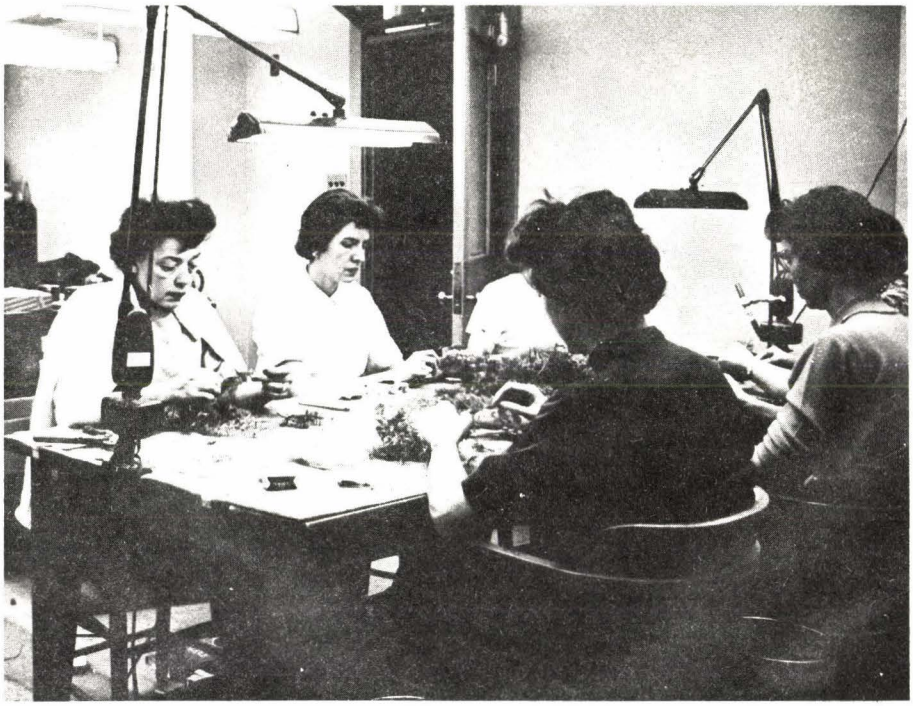


A stand of mixed conifers defoliated by the Douglas-fir tussock moth.

SPRUCE BUDWORM, Choristoneura fumiferana Clem. A long-standing outbreak of this moth continues to cause heavy damage in Douglas-fir and true fir stands within Montana and Idaho. The amount of infested area remained about the same in 1965 within Montana, but increased greatly in Idaho. This is illustrated in table 1.

Table 1.--Acres infested by spruce budworm

State	1964	1965
Montana	1,859,983	1,882,640
Idaho	329,607	501,000
Total	2,189,590	2,383,640



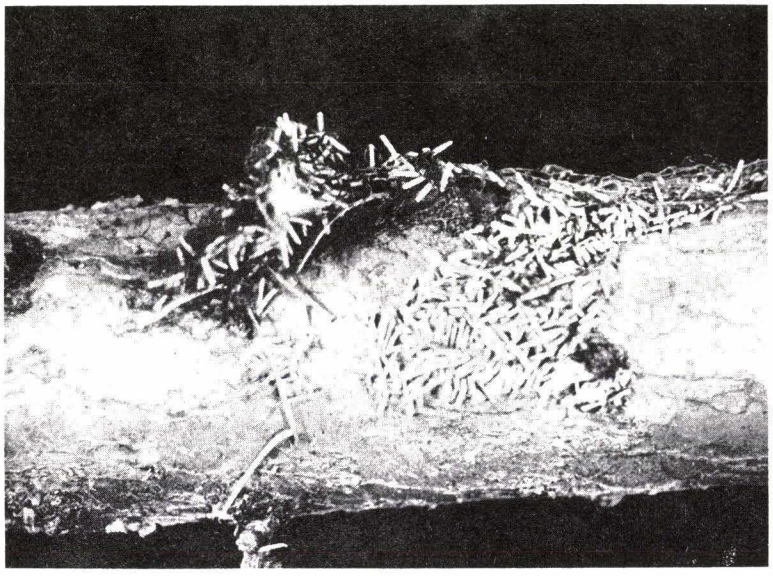
Workers searching for spruce budworm egg masses on Douglas-fir foliage.

However, the number of egg masses on the foliage of infested trees in Montana decreased greatly since 1964. Where foliar damage was observed in 1965, it was often quite severe; light damage usually occurred at higher elevations. There was comparatively little of the moderate damage class. This downward trend may mean that damage will be less in 1966. Table 2 lists comparative data taken annually from 25 plots in Montana since 1959:

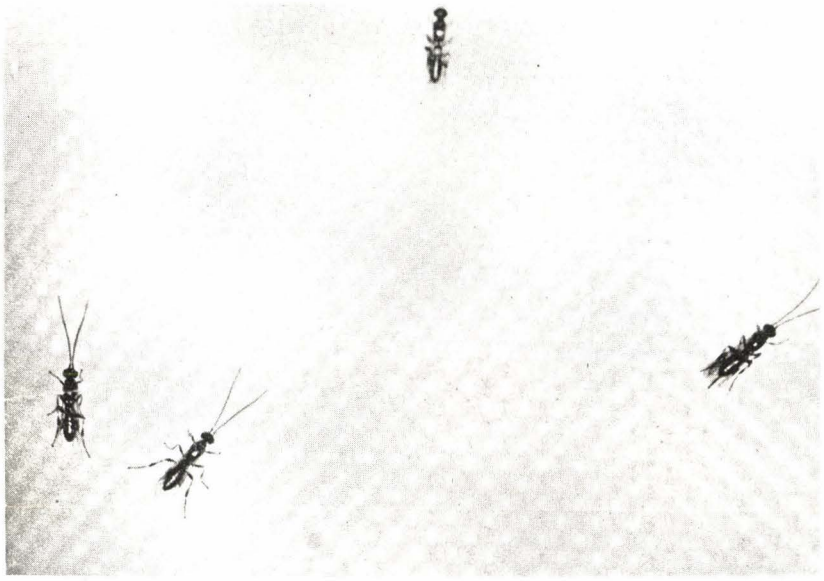
Table 2.--Annual measurements of factors affecting the trend of spruce budworm infestations in Montana

Factor	1959	1960	1961	1962	1963	1964	1965
Percent defoliation	38.00	34.00	37.00	25.00	35.00	35.00	38.00
Egg masses per M sq. in. of foliage	10.40	4.10	8.40	10.50	9.50	11.90	5.33
Percent egg parasitism	3.80	1.00	4.30	6.00	.00	1.10	.50
New foliage growth (inches)	.81	.59	.69	.78	.93	.76	.86
New foliage destroyed (inches)	.31	.20	.26	.20	.32	.26	.33
Net foliage growth (inches)	.50	.39	.43	.58	.61	.50	.53

Data collected from three plots in Idaho showed that average defoliation was 55 percent and that there were only two egg masses per 1,000 square inches of foliage.



A large colony of larch casebearer larvae overwintering inside their cases on the bole of a sapling larch tree.



Adult Agathis pumila on side of cage. These wasps are parasitic on the larch casebearer. Note female on right with protruding ovipositor.

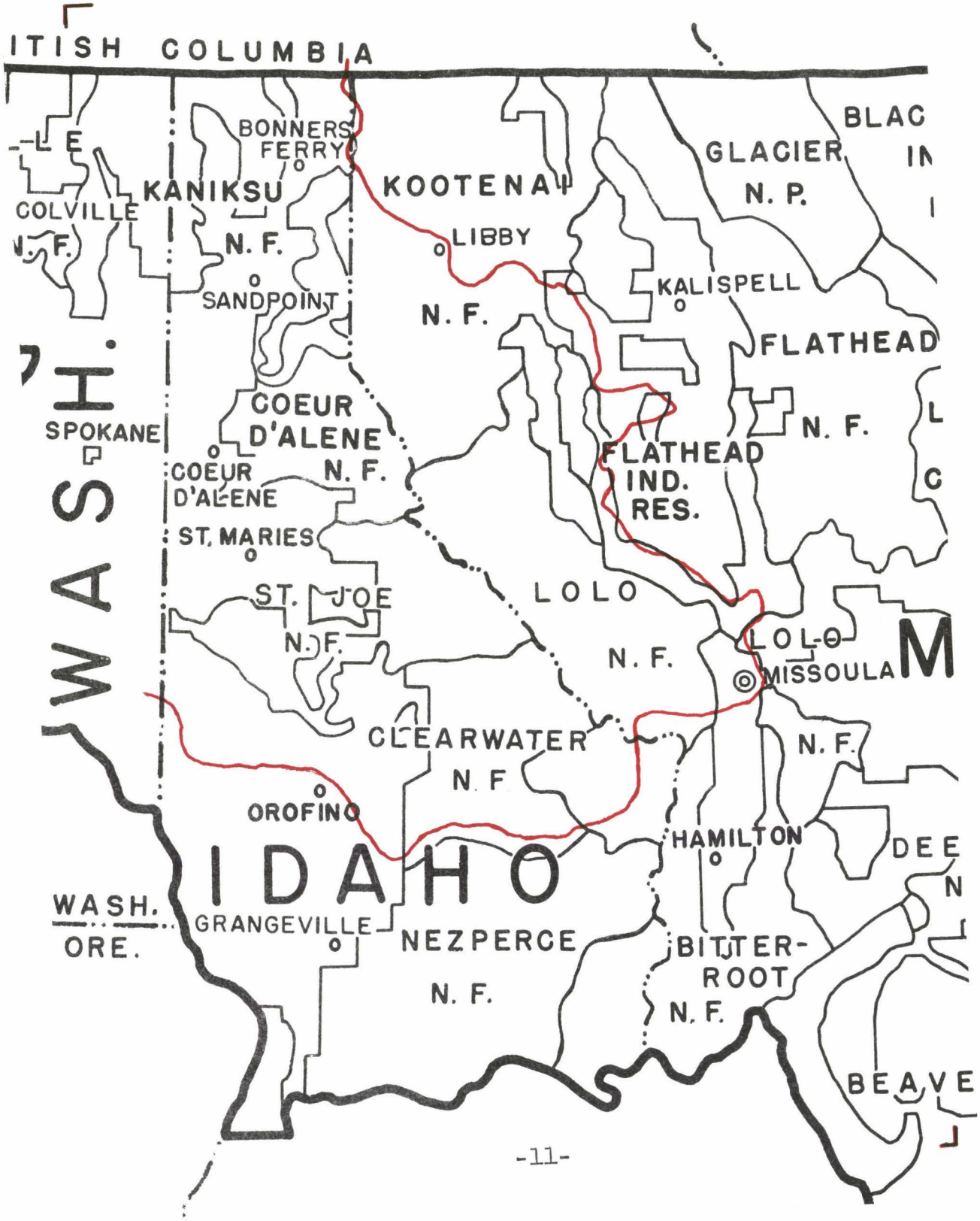
LARCH CASEBEARER, Coleophora laricella Hbn. Populations of this moth are distributed worldwide on nearly all species of Larix. They were transported from Europe to Massachusetts in 1886. By 1953, casebearers became firmly established near St. Maries, Idaho, and are rapidly invading the 2,520,000 acres of western larch in the Northern Region. Nearly 2 million acres of infested larch were found from eastern Washington east to Elmo, Montana, and from the Canadian border south to the Lochsa River, Idaho, during 1965 (fig. 1).

The larch casebearer has not been responsible for tree mortality yet, but many stands in northern Idaho have suffered great reductions in radial growth.

Parasites, imported from Europe in 1930, reduced eastern casebearer populations to tolerable levels. A program of establishing parasites in the West was begun. As yet, only a few western insects have been found that parasitize casebearers. The wasp Agathis pumila was shipped from the East in 1960, and liberated near St. Maries, Idaho. Progeny of these pioneers were collected in 1962 and 1963 which indicated they could survive in the new environment. This success promoted the importation of parasitized casebearer larvae from Vermont in 1964 and Massachusetts in 1965. Wasps were reared from these larvae, then liberated and colonized in northern Idaho.

Chemical control of this defoliator was also tried in Idaho and Montana. Malathion applied from the air gave satisfactory control.

Figure 1.--Forefront of the larch casebearer infestation in Idaho and Montana during 1965.

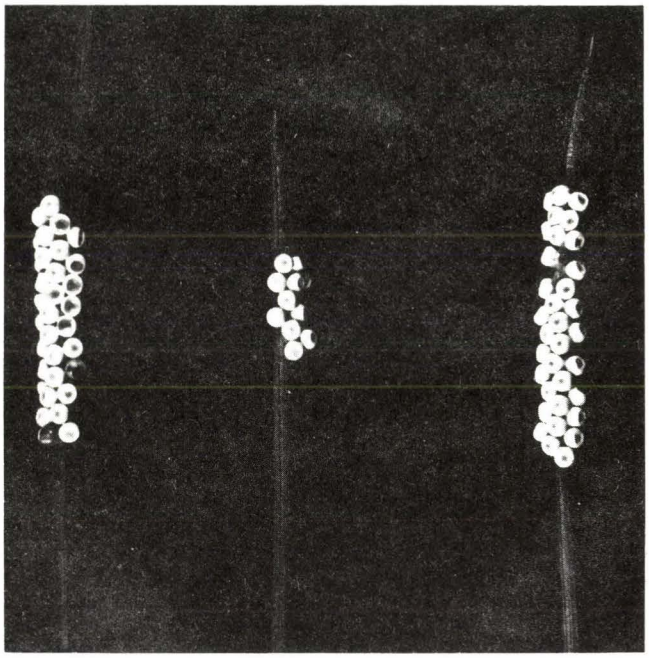


A LARCH BUD MOTH, probably Zeiraphera griseana Hubner. Outbreaks of this moth are cyclic in the Northern Region. The last noticeable damage occurred about 10 years ago. Since 1963, it has been increasing. More than 72,000 acres were defoliated on the Kootenai National Forest, Montana, from south of Troy to the Canadian border east to the Kootenai River during 1965. Kaniksu National Forest lands in Idaho contained about 56,000 acres from south of Bonners Ferry to Canada. East-facing slopes within the Swan River drainage harbored 12,000 acres which were heavily defoliated on the Flathead National Forest, Montana.

LARCH SAWFLY, Pristiphora erichsonii Hartig. Damage by this insect decreased in northern Idaho, but increased in Montana during 1965. About 15,000 acres were heavily defoliated on the Tally Lake District, Flathead National Forest, Montana. This infestation extended into 4,000 acres within the Sunday Creek drainage to the north. Many larch stands within tributaries of the Little North Fork Clearwater River drainage in Idaho were defoliated again. More than 25,000 acres were involved. There were five areas defoliated on the Clearwater National Forest, Idaho, from Musselshell north to the North Fork Clearwater River. The largest area contained about 5,000 acres.

A LARCH LOOPER, probably Semiothisa sexmaculata Pack. Infestations of this looper have become more abundant each year since 1963 in Montana. Several thousand acres of larch were noticeably damaged on the Raven Ranger District south of Libby. It was also reported in abundance near the head of the Swan River Valley.

A PINE TUSSOCK MOTH, probably Dasychira plagiata Wlkr. A major epidemic of this moth was recorded for the first time in eastern Montana during 1965. Defoliation of about 42,000 acres of ponderosa pine trees was visible from the air, and its presence was found in a total of 250,000 acres surrounding Ashland and Fort Howes, Montana. The epidemic is predicted to increase during 1966, and control measures are anticipated.



Pine tussock moth eggs on ponderosa pine needles.

A SPRUCE BUD MOTH, probably Zeiraphera ratzeburgiana Sax. Defoliation was evident in several areas of Engelmann spruce and subalpine fir within the boundaries of Yellowstone National Park, Wyoming. It was not reported from any other areas in the Northern Region.

COTTONWOOD LEAF BEETLE, Chrysomela scripta F. Leaf chewing was apparent on many cottonwood trees near the town of Ashland, Montana.

PINE NEEDLE-SHEATH MINER, Zelleria haimbachi Busck. Populations of this moth were at their highest during 1963 in the Northern Region when nearly 200,000 acres of lodgepole and ponderosa pines were infested. By 1965, only minor damage was reported. Its presence can still be detected in almost all stands of hard pine in Montana and Idaho.

DOUGLAS-FIR NEEDLE MIDGES, Contarinia pseudotsugae Condr. and C. constricta Condr. Very little damage was seen on current needles of Douglas-fir in northern Idaho and Montana in 1965. This seems to be the ebb of a population cycle that began in 1957 and reached its peak during 1962-63.

FOREST DISEASE CONDITIONS

CONDITIONS IN BRIEF

The generally cool, moist weather during the season apparently affected the development and intensity of several diseases throughout the Region. Late maturation of the "seed" plants of dwarfmistletoe coupled with an early freeze in September reduced seed dissemination in the vicinity of Missoula to approximately 20 percent of the potential. Heavy infection of the lodgepole pine dwarfmistletoe by Wallrothiella arceuthobii was observed in a localized area of the Kootenai National Forest. A single Engelmann spruce was found infected with larch dwarfmistletoe. Cross-overs by this mistletoe to spruce have been reported to occur very infrequently.

Needle cast diseases were especially prevalent in localized areas with severe discoloration of larch foliage due to infection by Hypodermella laricis noted through many areas of western Montana. Douglas-fir needle cast, Rhabdocline pseudotsugae, was severe in localized areas of the Bitterroot Valley and scattered Christmas tree plantations in western Montana and northern Idaho.

Leaves of black cottonwood, Populus trichocarpa, were heavily infected with the leaf rust Melampsora occidentalis. This increases the potential for heavy infections of Douglas-fir and larch in the 1966 season if proper climatic conditions occur during the infection period.

The early September freeze caused severe discoloration of the current season's foliage of Douglas-fir, lodgepole, and whitebark pine in several areas throughout the Region.

DWARFMISTLETOES

DWARFMISTLETOES, Arceuthobium spp. The dwarfmistletoes continue as the major disease pest in the Region. The annual mortality and growth losses caused by this parasite are unspectacular but are significant when considered in management through the rotation period of the susceptible species.

LARCH DWARFMISTLETOE, A. campylopodum f. laricis (Piper) Gill. A single collection of this form species was made on a 40- to 60-year-old spruce in the vicinity of Little Blue Creek about 35 miles northwest of Missoula. Only a single infection on the tree was found with no evidence of brooming observed. The infected spruce was in a stand of thinned larch which showed little evidence of dwarfmistletoe infection.

As far as can be determined, this is the third collection of A. campylopodum f. laricis on Engelmann spruce made in Montana. This crossover has been reported in other areas in the West but occurs quite infrequently in nature.

Crossover of larch mistletoe (Arceuthobium campylopodum f. laricis) to Engelmann spruce. This is a relatively rare occurrence.

LODGEPOLE PINE DWARFMISTLETOE, A. americana Nutt. About 80 to 90 percent of the pistillate ("seed"-producing) plants of A. americanum in a localized area in Mud and Sink Creeks, Kootenai National Forest, were found to be parasitized by the fungus Wallrothiella arceuthobii (Pk.) Sacc. Although the overstory was heavily infected with dwarfmistletoe, only occasional aerial shoots of the parasite could be found on the understory which averaged about 20 years of age. This fungus occurs sporadically and, according to earlier reports, is not considered to have any potential for biological control since it is primarily restricted to dry locations.

(See also the effects of early fall freeze on "seed" dispersal under Physiological Diseases.)

Stroma formed by fungus Wallrothiella arceuthobii on female plant of lodgepole pine dwarfmistletoe. This fungus is very specific, attacking only pistillate flowers and prevents formation of the "seed."

RUSTS

WHITE PINE BLISTER RUST, Cronartium ribicola A. Fischer. Blister rust has spread throughout all commercial western white pine stands as well as into most limber and whitebark pine stands in the Region. As a result, 5-needle pines cannot be successfully grown without protection. By removing all the alternate host plants (gooseberry and currants) within a white pine area and in a surrounding protection zone, the rust can be controlled. This is being done on all areas currently being regenerated to white pine.

In addition, direct control work using antibiotics is continuing. Very satisfactory results are being obtained by scarifying and treating

infections directly with Acti-dione (cycloheximide). Work was completed on 7,500 acres of National Forest land and 5,100 acres of State and private land during 1965. However, this method can be used only in those stands where most of the damaging infections are within reach of the ground. Most stands needing infection treatment are in areas where ribes eradication was not done until after a rather high percentage of the white pine became infected.

The use of antibiotics as an aerial spray is being discontinued. Effectiveness determinations have proved to be even more difficult than contemplated at the time the first test plots were treated.

Most stands of western white pine that have been aerially treated with antibiotics are in older age classes with many old infections on the upper portions of the tree boles. Positive results are apparently very slow in materializing or in becoming recognizable. However, some encouraging differences in tree mortality are becoming evident 5 years after aerial spraying. Within a few comparable white pine stands, much higher mortality is occurring in the untreated areas. For example, 1965 examinations of two white pine areas aerially treated with Phytoactin during the fall of 1960 and the spring of 1961 show 10 and 13 percent mortality due to blister rust of the dominant and codominant study trees. In a nearby untreated area, 42 percent of the white pine being evaluated are now dead. All study trees were initially evaluated and marked during the spring of 1961 and are scattered more or less at random throughout the areas. Since only a limited number of test areas have been aerially sprayed 5 years or longer, more time is needed to accurately assess aerial spray results.

SPRUCE NEEDLE RUST, Chrysomyxa sp. Spruce in Washington and Scofield Creeks on the Clearwater National Forest and in Adair Creek on the St. Joe National Forest were heavily infected by this needle rust. Previous reports have indicated that this rust has been collected in the Region, but heavy infections have not been observed in the past 4 years.

COTTONWOOD RUST, Melampsora occidentalis Jacks. Only relatively light infection of needle rust on Douglas-fir was evident throughout northwestern Montana this past season. However, the incidence of leaf rust on Populus trichocarpa T. and G. was exceedingly heavy. Based on recent studies (Ziller, W. G., 1965, Western Trees' Rusts), the potential for severe infection in Douglas-fir and larch from the overwintered telia is present. This potential infection is, however, dependent on the climatic conditions which prevail at the time of sporidial production and bud break of the coniferous hosts.

NEEDLE DISEASES

RHABDOCLINE NEEDLE CAST, Rhabdocline pseudotsugae Syd. Severe needle discoloration of Douglas-fir in early May and June was again evident through several drainages on the Bitterroot and Lolo National Forests. These areas were heavily infected by Rhabdocline for the second year in succession. Christmas tree plantations near Plains, Montana, and Sandpoint, Idaho, had about 80 percent of the trees over 4 years old heavily affected (more than 60 percent of the needles infected). Examinations in these areas in mid-November indicated heavy spotting of the needles typical of the early symptoms of the disease. Therefore, it appears that severe defoliation will again occur in 1966.

The initial results of chemical spray treatments with antibiotics indicate a substantial reduction in the incidence of infection by Rhabdocline. However, considerable variation in the amount of infection on individual trees within a treatment was noted. These tests are being continued.

LARCH NEEDLE CAST, Hypodermella laricis Tub. Infections of H. laricis of western larch were exceedingly heavy in the vicinity of Lolo Hot Springs and Fish Creek Divide on the Lolo National Forest; in the Swan River Valley on the Flathead National Forest; and on the Clearwater National Forest. Trees of all age classes from seedlings to overmature trees were severely affected. Many pole sized trees had 80 to 90 percent of their needles infected.

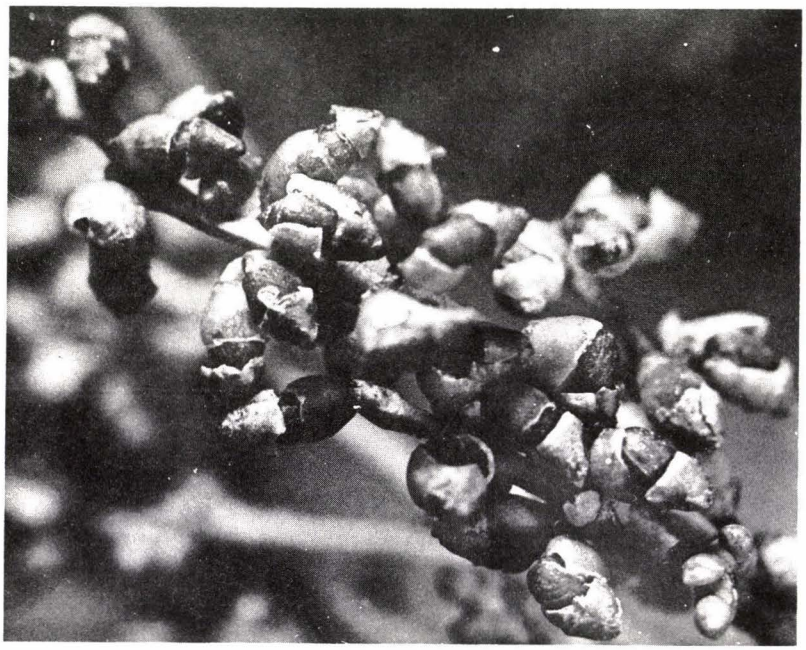
Although this disease is present every year in the Region, the infection is usually light. This is the first time in about 5 years that a severe outbreak has occurred.

LODGEPOLE NEEDLE CASTS, Hypodermella concolor (Dearn.), Darker and H. montivaga (Petrak) Dearn. The degree of infection of lodgepole pine by these needle casts throughout the Region was greatly reduced compared to the past two seasons. Heavy infections of H. concolor were present in the Squaw Creek drainage on the Gallatin National Forest. H. montivaga continued to be the primary cause of needle discoloration in the Rock Creek drainage near Red Lodge, Montana. Several other heavy infection centers were present throughout the Region, but the overall incidence of these diseases was greatly reduced.

PHYSIOLOGICAL DISEASES

RED BELT DISEASE. Approximately 1,000 acres of lodgepole pine in the vicinity of Alice Creek and Rogers Pass, Helena National Forest, showed evidence of winter damage. The affected trees were apparently subjected to high, dry winds during a period when the soil was frozen, and the moisture lost from the needles could not be replaced through translocation.

EARLY FALL FREEZE. Severe discoloration of lodgepole and whitebark pines and Douglas-fir occurred through extensive areas of the Region following a sudden drop in temperature during mid-September. Considerable variation in the degree of damage to a particular species was observed with most damage occurring on ridge tops and southerly exposures above the 5,000-foot level. Only the current season's needles were affected, and examination of the new buds failed to reveal any evidence of damage.



Arceuthobium americanum, lodgepole pine dwarfmistletoe with "seed capsules" ruptured through freezing.

One of the beneficial results which accrued from this early freeze was the resultant rupturing of the fruiting bodies of dwarfmistletoe. Observations indicated only about 20 percent "seed" dispersal by the dwarfmistletoes on lodgepole pine and Douglas-fir in the vicinity of Missoula, Montana. The freeze ruptured the fruiting bodies and prevented further dispersal of the seed.